

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 3-4, 7-8, and 12-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Friend et al. (US 6,429,601).

Regarding claim 1, Friend discloses an active matrix display device (fig. 1, see col. 1, line 49-50) comprising: a display with a plurality of display pixels (fig. 6, see col. 6, line 1-51);

a data input for receiving a data signal (fig. 6, control unit 24, see col. 6, line 26-51);

a controller for distributing said data signal over said display pixels to generate an image on said display with an overall brightness level during at least one frame period (fig. 6, processing means 28 and switch unit 31, see col. 6, line 26-51),

wherein said device is adapted to: divide said frame period for at least one subset of said display pixels (figs. 7 and 8, see col. 7, line 19-56, second cycle of fig. 8 divided into two sub-periods)

such that said display pixels of said at least one subset have at least a light output at a first non-zero brightness level during a first sub-period of said frame period (fig. 8, first pulse of second cycle, see col. 7, line 19-56) and at a second non-zero brightness level during a second sub-period of said frame period (fig. 8, second pulse of second cycle, see col. 7, line 19-56).

wherein the first and second levels of brightness are selected so that the time averaged sum of said brightness levels of said pixels within said at least one subset is substantially equal to said overall brightness level of said image in said at least one subset (figs. 7 and 8, see col. 7, line 19-56, on-time of the pixel is applied as a series of pulses to give total on-time per cycle needed to achieve the required duty cycle),

said second level being maintained a stable level during the second sub period (fig. 8)

and the first and second levels being in a known ratio (fig. 8, see col. 7, line 19-56, pulses equal, see also col. 8, line 3-17).

Regarding claim 3, Friend discloses wherein said device is adapted to determine one or more particular areas of said display and said subset is defined by said areas (figs. 6-8, see col. 7, line 37-56).

Regarding claim 4, Friend discloses wherein said device is adapted to determine the total time during which said display pixels have had a light output and said subset is

defined by said total time (figs. 7 and 8, see col. 7, line 19-56, cycle separated by lines 36).

Regarding claim 7, Friend discloses wherein said device is adapted to supply a select signal for selecting said display pixels of said subset (figs. 6-8, see col. 6, line 26-51),

said select signal comprising at least a first select signal triggering said first sub-period and a second select signal triggering said second sub-period (figs. 6-8, see col. 6, line 26-51; see also col. 7, line 19-56, pixel turned on and off more than once in each cycle).

Regarding claim 8, Friend discloses wherein said display pixels comprise current emissive elements driven by drive elements (fig. 5)

and said device is adapted to vary a voltage for said drive elements such that said at least one subset of current emissive elements is driven to at least said first brightness level during said first sub-period and said second brightness level during said second sub-period (fig. 8, first and second pulse of second cycle, see col. 7, line 19-56; see also col. 8, line 3-17).

Regarding claim 12, this claim is rejected under the same rationale as claim 1.

Regarding claim 13, Friend discloses wherein the first and second sub-periods are adjacent in time (figs. 7 and 8, see col. 7, line 19-56).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 2, 5-6, and 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Friend in view of Yamazaki et al (US 6,326,941).

Regarding claim 2, Friend fails to disclose wherein said display is a colour display and said subset is defined by colour (R, G, B).

Yamazaki teaches wherein said display is a colour display and said subset is defined by colour (R, G, B) (abstract, see also col. 1, line 52-62, color tone disclosed, use of R,G,B well known in the art).

Friend and Yamazaki are both directed to active matrix displays utilizing sub-frame periods. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the display of Friend with the display of Yamazaki since such a modification provides plural pulses to each picture element so that an average voltage of one frame of an image can be made an arbitrary value to

improve display quality using an intermediate color tone or gradation (Yamazaki, abstract).

Regarding claim 5, Friend fails to disclose wherein said first brightness level exceeds said second brightness level.

Yamazaki teaches wherein said first brightness level exceeds said second brightness level (figs. 3-5, specifically fig. 5B, see col. 8, line 55-62).

Regarding claim 6, Friend fails to disclose wherein said first sub-period has a shorter duration than said second sub-period.

Yamazaki teaches wherein said first sub-period has a shorter duration than said second sub-period (figs. 3-5, see col. 5, line 6-45).

Regarding claim 9, Friend discloses said light output of said display pixels of said at least one subset yields said first brightness level during said first sub-period and said second brightness level during said second sub-period (same rationale as claim 1).

Friend fails to disclose wherein said display is an active matrix liquid crystal display, said device comprising a backlight.

Yamazaki teaches wherein said display is an active matrix liquid crystal display, said device comprising a backlight (fig. 5, see col. 1, line 5-12, see also col. 9, line 7-16, backlight well known for liquid crystal display).

Regarding claim 10, Friend fails to disclose wherein said display is a colour display and said backlight is a LED-backlight or a colour sequential backlight.

Yamazaki teaches wherein said display is a colour display (abstract, see also col. 1, line 52-62, color tone disclosed) and said backlight is a LED-backlight or a colour sequential backlight (fig. 5, see col. 1, line 5-12, see also col. 9, line 7-16, liquid crystal display disclosed, LED-backlight and color sequential backlight well known for liquid crystal display).

Regarding claim 11, Friend fails to disclose wherein said device is adapted to generate said light output such that said second brightness level has a brightness that is 30% or less than said first brightness level.

Yamazaki teaches wherein said device is adapted to generate said light output such that said second brightness level has a brightness that is 30% or less than said first brightness level (figs. 3-5, see col. 5, line 6-col. 6, line 15, 5-radix notation disclosed, i.e. 5 voltage levels).

Response to Arguments

5. Applicant's arguments with respect to claims 1 and 12 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Koyama et al. (US 6,590,581) discloses a display device in which a one-frame image is formed by displaying 2^{m-n} subframes formed from the n-bit digital video data.

Yamaguchi et al. (US 6,222,515) discloses a driving device of an active matrix type liquid crystal display unit including a liquid crystal display panel, a scan driver, and a data driver, a data voltage controlling apparatus is provided to achieve digital multiple gray-scale levels with little flickering utilizing a combination of different waveforms, a combination of negative level and positive level, and a combination of two different voltages having at least a voltage difference.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KEITH CRAWLEY whose telephone number is (571)270-7616. The examiner can normally be reached on M-F, 7:30-5:00 EST, alternate Fri. off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bipin Shalwala can be reached on (571)272-7681. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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